We then have $A^1 = \frac{l\,m\,f^1}{f}$;

and for the brilliance of the bright line spectrum, we get

$$\Lambda = \frac{Q}{A'} = \frac{i\,l\,w\,a^2 - f^2 S}{l\,m\,f\,f^1} \qquad (6)$$

If we neglect S, the loss of light in transmission through the apparatus, and suppose $f = f^1$, this becomes

$$\Lambda' = \frac{i\,w\,\mathrm{a}}{m\,f^2} \qquad (7)$$

These formulæ show that with a spectrum of this kind we may, without diminishing the brightness of the lines, increase the dispersive power of our instrument to any extent by increasing its linear dimensions; if we increase the dispersive power by adding to the prism train, the case is different, since *S* is a function of *n*, the number of prisms.

New form of Spectroscope.—I close the article with the suggestion of a new form for a chemical spectroscope, which seems to present some advantages in the saving of material and labour as well as of light.

The figure (Fig. 4) sufficiently illustrates it, except that it may be necessary to add that I have not represented any of the many possible convenient arrangements for reading off the positions of lines observed. The centre of motion for the telescope is at *c*, the collimator remaining fixed.

The half prisms of heavy flint-glass are concave at the rear surface, and directly cemented to the single crown glass lenses, which form the object-glasses of telescope and collimator. There is thus a saving of two surfaces over the common form; and, what is more important, the prisms to fit telescopes of a given aperture are considerably smaller on the face, and can be made from plates of glass of less than half the thickness required by the ordinary construction, a circumstance which greatly reduces the difficulty of obtaining suitable material.

NOTES

We learn by British-Indian cable that the English Government Eclipse Expedition arrived at Galle on Monday last; all well. The authorities in India and in Ceylon are doing everything they can to assist the party. M. Janssen has gone to the Neilgherries. Mr. Lockyer is in communication with Colonel Tennant. The weather was at that time fine.

Professor John Young has written to the *North British Daily Mail*, detailing the reasons for the notice of motion which he gave in April last to the General Council of the University of Glasgow, relative to the division of the chair of Natural History in that University. The duties of the chair would render it incumbent on its occupant to teach, if required to do so, Zoology, Comparative Anatomy and Physiology, Geology and Palæontology, Mineralogy, Mining, Metallurgy, and possibly Meteorology. Actually, Professor Young gives instruction in Comparative Anatomy and Geology. He is naturally extremely anxious that he should no longer be called upon to teach subjects which, in the present state of science, it is impossible can be efficiently combined. It is to be hoped that, before long, the University will see the necessity of instituting a separate chair of Geology, as has recently been done at Edinburgh; but where will be found a Sir Roderick Murchison to endow it in so munificent a manner?

At the second M.B. Examination for Honours at the University of London, Mr. William Henry Allchin, of University College, has taken the Scholarship and gold medal, and Mr. Henry Edward Southee, of Guy's Hospital, the gold medal in Medicine; Mr. Richard Clement Lucas, of Guy's Hospital, the gold medal in Obstetric Medicine, and Mr. Ernest Alfred Elkington, of the General Hospital, Birmingham, the gold medal in Forensic Medicine. At the second B.A. and second B.Sc. Examination, Mr. Thomas Olver Harding, of Trinity College, Cambridge, obtained the Scholarship in Mathematics and Natural Philosophy. No gold medals were awarded in Animal Physiology, Chemistry, Geology and Palæontology, or Zoology.

Mr. Lazarus Fletcher, of the Manchester Grammar School, was on Saturday last elected to the vacant scholarship at Balliol College, on the foundation of Miss H. Brakenbury, for the encouragement of the study of Natural Science. Mr. Hainsworth, of the same school, and Mr. Greswell, of Louth School, were also mentioned by the examiners as worthy of commendation. The scholarship is worth 70*l.* a year, and is tenable for three years.

With reference to the destruction of the Museum at Chicago, we learn that Dr. Stimpson's own collection of North American shells formed part of the Smithsonian Museum; and that the collection made by Professor Agassiz and Count Pourtales, in their deep-sea explorations of the Gulf of Mexico, belonged to the Cambridge Museum. Many of Dr. Stimpson's MSS. and drawings have been published. Mr. Gwyn Jeffreys was, as our readers are aware, fortunately the means of saving some of the shells from the Gulf of Mexico, which he is now engaged in working out before returning. Many valuable specimens which Mr. Jeffreys took to Chicago of course shared the fate of the remainder; some of them, however, he hopes to be able to replace. Professor Agassiz has offered Dr. Stimpson a place at Cambridge, Mass., and to give him the means of again carrying on dredging operations in the Gulf of Mexico.

A fine young pair of the Grey seal (*Halichœrus grypus*) has just been added to the Zoological Society's living collection. This species, although not uncommon on some parts of the British coast, has never previously been received alive by the Society. The present specimens were obtained near St. David's in South Wales, where this seal is said to be of not unfrequent occurrence. Besides this seal, the Society's collection also contains examples of three other Phocidæ—namely, the sea-lion (*Otaria jubata*), the Cape eared seal (*Otaria pusilla*), and the common seal (*Phoca vitulina*).

In the Northern United States the richest marine fauna is to be found in the vicinity of Eastport, Maine, the adjacent region of the Bay of Fundy having become classic ground through the labours of Stimpson, Verrill, Packard, Morse, Webster, Hyatt, &c. It is rumoured, according to *Harper's Weekly*, that Mr. J. E. Gavit, of New York, president of the American Bank-note Company, and at the same time an eminent microscopist, has it in contemplation with some friends to erect a building at Eastport, to be suitably endowed and maintained for the use of any naturalists who may wish to avail themselves of the facilities it may afford. We can only hope that so excellent an idea may be realised at an early day.

The latest advices from Captain Hall's expedition were dated at Upernavik, September 5, being somewhat later than the information brought back by the *Congress*. After parting with the *Congress* at Disco, Captain Hall sailed nearly north until he reached the harbour of Proven, where he landed and endeavoured to obtain dogs. In this, however, he was not very successful, procuring only eighteen, most of which were not well fitted for service. From Proven the *Polaris* proceeded to Upernavik, arriving there on the 30th of August. He left that port on the 5th of September, and continued on his polar journey.

Among the movements of naturalists abroad, we understand that Mr. J. Matthew Jones, F.L.S., President of the Nova Scotian Institute of Natural Science, intends spending the winter months in the Bermudas, for the purpose of more thoroughly investigating the marine zoology of the group.

Messrs. Westermann, of Brunswick, announce for early publication, in two volumes, a rendering into German, by Herr Schellen, of the French translation of P. Secchi's "Le Soleil."

THE *Feuille des Jeunes Naturalistes*, to which we called attention some time ago, has entered on its second year of existence in a somewhat enlarged form. Aiming at the development of an intelligent love of nature amongst French schoolboys, it claims the sympathy of all those amongst ourselves who, by means of school museums and natural history societies, are labouring in the same field. The editor solicits contributions from English boys, on any subject connected with natural science, which he promises carefully to translate and publish.

ON the 5th of January, 1872, will be published, in Bombay the first number of a monthly journal, the *Indian Antiquary*, intended as a medium of communication between Oriental scholars in India, Europe, and America, and a repertory for information on the Antiquities, History, Geography, Literature, Religion, Mythology, Natural History, Ethnography, and Folklore of India and adjoining countries, and thus embracing a similar variety of subjects to the English *Notes and Queries*, the plan of whieh the *Indian Antiquary* will, to some extent, follow. The most eminent Orientalists in India, Europe, and America, it is expected, will become contributors to the pages of this journal, and it will be edited by Mr. J. Burgess, M.R.A.S., F.R.G.S. The London agents will be Messrs. Trübner and Co.

WE have received the first number of "The Garden," a weekly newspaper, edited by Mr. W. Robinson, F.L.S. It contains original articles by the editor and other correspondents on gardening topics, illustrated by wood-cuts, instructions for gardeners suited to the time of the year, descriptions of new plants, &c.

MR. W. F. DENNING, the Honorary Secretary of the Observing Astronomical Society, publishes "Astronomical Phenomena in 1872," a complete guide to the astronomer for the more important phenomena to be looked for during the year.

MR. ROTHSCHILD, of the Rue des Saints Pères, Paris, has commenced publishing, in large folio numbers, a magnificent work upon the Trajan Column at Rome. A complete series of mouldings was executed in 1862, by order of the Emperor, for the Louvre Museum. A cast was taken of these mouldings in galvano, by the Procédé Oudry, and from these casts phototypographic plates have been done. There will also be many woodcuts interspersed through the work. The letterpress will be by M. W. Frochnor, the conservator of the Louvre Museum. It will be finished in 1873.

MR. CUTHBERT COLLINGWOOD, M.A. and B.M., Oxon, F.L.S., &c., author of "Rambles of a Naturalist on the Shores and Waters of the China Seas," &c., announces, as in the press, "A Vision of Creation," a poem, with an introduction, geological, and critical.

PROF. HUXLEY, in his address at the distribution of prizes at the Oxford Local Examination at Manchester, spoke as follows: "He believed that he was speaking entirely within measure when he said now that there was nowhere in the world a more efficient or better school, so far as it went, for teaching the great branches of physical science than was at the present time to be found in the University of Oxford. He thought it right that he should here state what had come to his knowledge as a member of the Royal Commission connected with these matters. That noble University had within the last ten or fifteen years devoted no less than about 100,000*l*. to the endowment and equipment of physical science and physical science only.

M. JOLY, a distinguished member of the French Academy of Medicine, has recently read a paper before that learned society, in which he attributes the enervation of the nation, as evinced during the late war, to the combined effect of alcohol and nicotine upon the national character. "Tobacco," says Dr. Joly, "although of only recent introduction, has gained upon its older rival. Imitativeness and 'moral contagion' have done their work, until the use of this poison has penetrated everywhere—has enslaved the nation, caused personal and racial degeneracy, enervated the entire army, and made it slow to fight and powerless in action. The use both of spirits and tobacco has frightfully increased, and human depravity could scarcely devise a worse compound than the mixture of brandy and tobacco, which is the latest liquid novelty patronised by Parisian sensualists. The French consume more tobacco than any other nation."

THE *Gardener's Chronicle* states that a series of photographs devoted to the illustration of Linnean relics has been recently issued in Sweden, and copies are to be procured in London. They consist of photographs of Linné's statue in the Botanical Garden at Upsala, of the Botanical Garden itself, the monument in Upsala Cathedral, his country seat and museum at Hammarby, a portrait, one of his letters, and other objects of interest in connection with the great naturalist.

AN interesting contribution to the supposed "Serpent Worship" in Scotland is stated to have been lately discovered near the shores of Loch Fell, near Oban, where the form of a monstrous serpent three hundred feet in length has been disinterred. From the accounts which have been published it would appear that the figure of the serpent was excavated in the rocks above the lake, and had become overgrown.

SOME interesting experiments have lately been tried at the Crystal Palace to improve the illuminating power of ordinary gas. The inventor, by mixing a certain proportion of oxygen with the gas as it issues from the burner, claims to have found both a more economical and a more wholesome method of burning gas. There is no doubt that the light is much more brilliant, the only question is whether it is not too expensive. The oxygen is generated by passing supersaturated steam over red manganate of soda previously heated in dry air. The steam absorbs the oxygen from the manganate, and on being condensed the oxygen passes over alone and is mixed with the gas at the burner.

THE *Indian Medical Gazette* says that a report furnished by the Inspector of Police to the Bengal Government shows that of 939 cases of snake bites in which ammonia was administered by the police 702 are reported to have recovered, and the average length of time between the bite and the application of the ammonia is said to have been in fatal cases 4h. 12m. 13s., and in cases of recovery 3h. 28m. 14s.

ON the 29th of September a slight shock of earthquake was felt at Memoodabad in the Ahmedabad Collectorate, Bombay.

IT is stated that an aerolite weighing 127lb. fell lately near Montereau (Seine-et-Marne) in France. It appears to have come from the east, and burst with a loud explosion, giving a bright blue light. It is of an irregular spheroid shape and black, and is to be sent to the Academy of Sciences.

A VERY violent typhoon raged at Hongkong on the 2nd of September, doing an immense amount of damage both on land and sea.

ON October 16th a terrific hurricane swept over Halifax, New Brunswick, and caused a large amount of damage. It was accompanied by an extraordinary high tide, which was unexampled in the history of the city for damage and violence. On the same and the following day, very heavy storms were experienced on Lake Superior and Lake Huron, which caused the destruction of many vessels and the loss of numerous lives.

IN Ecuador there have been discovered in the forests of Santa Helena the trees yielding the red guinea bark.

An earthquake took place in the beginning of October on the Isthmus of Chiriqui near Panama.

Dr. Robert Brown, in a communication on the "Interior of Greenland," states that all the results of the attempted explorations of the interior serve to show that this is one huge *mer de glace*, of which the outlets and overflow are the comparatively small glaciers on the coast, though when compared with the glacier system of the Alps, they are of gigantic size. The outskirting land is, to all intents and purposes, merely a circlet of islands of greater or less extent. There are, in all probability, no mountains in the interior—only a high plateau, from which the unbroken ice is shed on either side to the east and west, the greater slope being toward the west. No mountains have been seen in the interior, the prospect being generally bounded by a dim, icy horizon. Dr. Brown considers Greenland susceptible of being crossed from side to side with dog or other sledges, provided the party start under experienced guides, and sufficiently early in the year.

Occasional glimpses of pre-historic times are afforded to us. One of the Indian papers records the deeds of a mad elephant, which made its way from the Rewah territory into the Mundla district. The first day it attacked the village of Tarraj, when the inhabitants took refuge on the roofs, but it killed a woman and child. The next night it went to the village of Mauzah and killed a boy. Two days after it killed a woman at Barbashore, and on the following night added to the number a man and woman at Kamaria. Thence it made its way to Donoria, and the villagers tried to escape, but two old women met their death, and another was trampled on and seriously injured. Its next stage was Manori, destroying a woman and two children, and so to Karbah. Here it snatched a baby from the mother's arms and killed it, and in the evening succeeded in killing a man in the same place. The next night a man was killed at Nigheri, and on that following another at Banu. On the 7th February it met with a check in passing the Ramgurgh Tahsil, where it was fired on, and retreated to Bijori, taking revenge by killing a man and a boy. On the 8th it surprised a party of villagers in the jungle, who had escaped from Nanda, again taking a woman's baby from her arms and killing it. The next slaughter was of a man at Belgaon and another at Belgara. It then visited Sayla, the villagers making their escape, except one boy, who was caught by it, but only rolled about for fun, but the elephant went into the village and pulled down several houses. By the 15th he was at Mohari, and injured a man and woman by rolling them about without killing them. On the 19th it killed one man and wounded another at Naraingunj. By this time a party was got together to resist it, about three weeks having elapsed, and the animal was driven across the river Nerbudda and into the jungle of a hill, but from which the force was inadequate to dislodge it. In three weeks it drove the people out of many villages, killing twenty-one persons, wounding others, and ravaging the country. It is alleged to have devoured five of its victims. The above recital of what took place in a relatively settled country, gives colour to the legends of Hercules and Theseus. In this case nothing is said of the destruction of crops which must have taken place.

An improvement in the apparatus attached to fire-engines has been proposed by Mr. Prosser in the form of a spreading fire-nozzle, the object of which is, by means of a number of moveable as well as fixed fingers so to direct the jet of water that it shall divide it into a more or less fine spray. The water is thus economised, and instead of a large proportion running off after scarcely coming into contact with the burning material, every drop, falling in the form of a conical shower of rain, performs its part towards extinguishing the fire.

COLDING ON THE LAWS OF CURRENTS IN ORDINARY CONDUITS AND IN THE SEA

II.

Forchhammer has filled up that gap by his researches upon the water of the ocean; for we can now, by the help of his results and of the temperatures, ascertain pretty exactly the specific weight of the water of the ocean in the principal seas of the globe. Calculation has proved the correctness of Maury's original notion, viz., that the density of the water of the ocean is least at the equator, and increases with tolerable regularity in proportion as we advance towards the north and towards the south. The water of the Atlantic seems to be of the greatest density at about 60° N. latitude to the south and south-east of Greenland. If we take this density as unity, the specific weight of the water of the sea will on an average be represented by the following numbers :—

Northern Hemisphere		Southern Hemisphere	
Between 60° and 70° latitude in Davis Straits .	0·9980	Unknown	
About 60° latitude in the Atlantic	1·0300	Unknown	
Between 50° and 60° latitude in the Atlantic . .	0·9994	In the Cold Currents of Cape Horn	0·9990
Between 40° and 50° latitude in the Atlantic . .	0·9985	In the Atlantic	0·9984
Between 23° and 40° latitude in the Atlantic . .	0·9972	In the Atlantic	9·9970
Between 0° and 23° latitude in the Atlantic . .	0·9966	In the Atlantic	0·9966

Of these the former, those of the Northern Hemisphere, are most to be depended on, because the observations there have been most numerous.

It will be seen by this table that the density of the water of the ocean increases along with the latitude, and in almost the same proportion both north and south of the equator. But Forchhammer has also determined the saltness of the sea at various depths, and has found that it decreases in very slow proportion with the increase of the depth. It we start from this fact, taking account at the same time of the decrease of temperature in proportion to the depth, we find the result to be that, at 500 fathoms below the surface, the density of the water of the sea over the whole globe may be considered as equal to 1, the difference at any particular point being scarcely discernible. But since the density of the water of the ocean at a depth of 3,000 feet is everywhere equal to 1, and since at the surface it diminishes as we approach the equator, it is evident that the mass of water underneath cannot be in equilibrium; that if the surface of the sea is more elevated between the tropics than under the poles, and if we take the mean densities given above, at the surface, and at the bottom of this liquid mass, we find that the height of the surface of the sea above the level corresponding to the density of 1, ought to be nearly as follows :—

Height between the Equator and the Tropics 6·6 feet.
,, ,, Tropics and 40° lat. . 4·2 ,,
,, ,, 40° and 50° ,, 2·2 ,,
,, ,, 50° and 60° ,, 0·9 ,,
,, at 60° ,, 0·0 ,,
,, between 60° and 70° ,, 3·0 ,,

But a similar difference of level necessitates the formation of a double surface-current passing from the equator to the two poles, and that cannot take place without entailing a diminution of the height of the water under the tropics, unless, indeed, there be an equivalent afflux into the tropical seas. But if the level of the water between the tropics be lower, the equilibrium of the under strata will be destroyed, and there ought, consequently, to be a submarine current which comes both from the north and the south towards the equator. That there really exists a current in that direction is a result of the circumstance that the temperature of the sea decreases with the depth.

Supposing then that there were no other forces in action, the difference of level mentioned above, ought, as Maury at first admitted, to give rise to a surface-current from the equator to the poles, and an under-current from the poles to the equator. But these currents are enormously modified by the intervention of other forces. The north-east trade-winds react against this equatorial current of the northern hemisphere, exercising upon the surface of the sea an oblique pressure, of which the effect is greater than that of the difference of level. There results from this, reckoning from the 30° latitude, a rising of the